

# MEDICAL PROCEEDINGS

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### REDAKSIONEEL · EDITORIAL

#### HART- EN ANDER ERNSTIGE KWALE

##### 'N SUID-AFRIKAANSE STUDIE

Elders in hierdie uitgawe publiseer ons 'n insiggewende ontleding van die voorkoms en oorsake van sterfte (sowel as ernstige chroniese siektes) onder blanke werkers van die Suid-Afrikaanse Spoorweë deur dr. A. M. Adelstein, van die Departement van Gesondheid en Nywerheidswelsyn van die Suid-Afrikaanse Spoorweë.

Met die oog op die feit dat 10% van die werkersbevolking van Suid-Afrika in diens van die Suid-Afrikaanse Spoorweë staan, kan hierdie gemeenskapsgroep waarskynlik as verteenwoordigend van die land as 'n geheel beskou word.

Dr. Adelstein se oorsig dek 'n tydperk van vyf jaar (1954-59), en sy ontleding behels die aantekeninge in verband met naastenby 100,000 manne wat by gedurende die oorsigstydperk opgestel het.

Etlke interessante feite word aan die lig gebring.

Getuienis wat in die Verenigde Koninkryk ingewin is, skyn definitief en positief daarop te dui dat liggaamsoefening 'n mens teen koronêre trombose beskerm. Wat hierdie punt betref, bots dit met die getuienis in die V.S.A. 'n Onlangse studie wat deur die Du Pont-organisasie onderneem is, dui daarop dat die koronêre trombose-aanvalsyfer op alle ouderdomme kleiner is in die geval van manne in die hoogste en die hoër middelinkomsteklas (d.w.s. onder uitvoerende amptenare, bestuurders en sogenaamde 'wit boordjie'-werkers) as

#### HEART AND OTHER SERIOUS DISEASE

##### A SOUTH AFRICAN STUDY

Elsewhere in this issue Dr. A. M. Adelstein, of the Department of Health and Industrial Welfare of the South African Railways, publishes an illuminating analysis of the incidence and the causes of death (as well as serious chronic disease) among White railwaymen employed by the South African Railways.

As about 10% of the South African working population works for the South African Railways, this sample of the community probably mirrors events in the country as a whole.

Dr. Adelstein's review covers a period of 5 years (1954-59) and his analysis involves records of close on 100,000 men during the period under review.

Several interesting facts emerge:

The evidence in the United Kingdom appears to be definite and positive that physical exercise protects against the occurrence of coronary thrombosis. The evidence in the U.S.A. on this point is conflicting. A recent study at the du Pont organization indicates that men in the highest and upper-middle salary brackets (who were executives, managers and white collar workers) had lower rates of attacks of coronary thrombosis at all ages than did the wage roll employees (who were on the whole more physically active than the 'salaried' employees).<sup>1</sup>

1. Pell, S. and D'Alonzo, C. A. (1961): *A Three-Year Study of Myocardial Infarction in a Large Employed Population*, J. Amer. Med. Assoc., **145**, 463.

onder loontrekkende werknemers wat oor die algemeen fisies meer aktief as die 'gesalarieerde' werknemers is.<sup>1</sup>

Die Suid-Afrikaanse studie lewer geen bewys op ter staving van die sienswyse dat oefening 'n beskermende effek in hierdie verband het nie. Op alle ouderdomme tot 65 jaar is die Suid-Afrikaanse sterftesyfer ten gevolge van koronêre trombose heelwat hoër as die syfer in die Verenigde Koninkryk. 'n Interessante feit is dat die Suid-Afrikaanse aanvalsyfer 'n noue ooreenstemming met die Amerikaanse syfer toon. Dr. Adelstein se stimulerende navorsingswerk vestig die aandag op die ooreenkoms tussen die V.S.A. en Suid-Afrika, en op die feit dat blanke werkers in albei lande 'n hoë lewenstandaard geniet wat die dieetgewoontes van die gemeenskap beïnvloed.

Dit is te betwyfel of die toevlug wat te laat, d.w.s. op middeljarige leeftyd, tot inspannende oefening soos tennis geneem word, 'n persoon inderdaad teen die ramp van koronêre trombose kan beskerm, gesien die ingewikkelde, onduidelike en onbekende maar kragtige oorsake wat saamspan om infarkt onder Suid-Afrikaanse toestande teweeg te bring.

Nog 'n sonderlinge maar belangrike feit wat deur die Suid-Afrikaanse Spoorwegopname aan die lig gebring is, is die differensiële frekwensie van noodlottige ongelukke op die paaie van ons land. Die sterftesyfer is naamlik vier keer groter onder handewerks as onder 'wit boordjie'-werkers. Hierdie verskynsel staan nie in verband met arteriosklerotiese hartkwaal nie. Die wederkerige betrekking tussen die tyd van die dag (ná 5-uur in die middag) en die dag van die week (Vrydae en Saterdag) dui op faktore wat niks met siekte te maak het nie, en suggereer dat kragdadige stappe gedoen moet word om die sosiale oorsake wat vir hierdie vermybare tragedie van die paaie verantwoordelik is, vas te stel en teë te werk.

Die lewenstandaard van blankes in Suid-Afrika is beslis net so hoog, en miskien hoër as die lewenstandaard in Wes-Europa, en tog is daar onlangse bewyse wat daarop dui dat die sterfte-ondervinding in Suid-Afrika tot op die ouderdom van 65 jaar nie so goed soos elders is nie.

As gevolg van 'n vergelykende studie van sterfte-neigings in Suid-Afrika en sekere Statebondslende sê Gonin:<sup>2</sup>

'In die geval van sowel manne as vroue het 'n vergelyking van die lewenstabel-tariewe aan die lig gebring dat die sterfetatariëwe in Engeland en Wallis laer as die tariewe in Suid-Afrika vir alle ouderdomme vanaf 0 tot 65 jaar is. Daarna is eersgenoemde tariewe effens hoër as die Suid-Afrikaanse syfers . . .

The South African study provides no evidence for the view that exercise has a protective action in this regard. The South African mortality rates for coronary thrombosis are considerably higher than those for the United Kingdom at all ages up to 65 years. Interestingly enough, the South African rate of all attacks is similar to that in the U.S.A. Dr. Adelstein's stimulating researches draw attention to the similarity between the U.S.A. and South Africa, in both of which countries the White working population enjoys a high standard of living and the dietary habits of the community are influenced accordingly.

It seems doubtful whether a belated resort, after middle age, to strenuous exercises such as tennis can, in fact, protect against the catastrophe of coronary thrombosis in the face of the complex, obscure and unknown potent causes which operate to precipitate the infarction under South African conditions.

Another curious and important fact which emerges from the South African Railway Survey is the differential frequency with which death from accidents occurs on the road. Fatalities are 4 times commoner in manual workers than in white-collar workers. The phenomenon is not related to arteriosclerotic heart disease. The correlation with time of day (after 5.00 p.m.) and day of the week (Fridays and Saturdays) points to factors unrelated to disease and suggests that vigorous measures should be directed at establishing and dealing with the social causes responsible for the avoidable tragedy of the roads.

The high standard of living of White South Africans is certainly up to that of the Western European level, if, indeed, it does not exceed it. Yet there is recent evidence that our mortality experience in South Africa up to age 65 years is not as good as elsewhere. Gonin<sup>2</sup> states (as a result of a comparative study of mortality trends in South Africa and certain Commonwealth countries):

'In the case of both males and females, a comparison by the life table rates, reveals that the mortality rates of England and Wales are lower than the South African rates from age 0 to about age 65; and thereafter they are slightly higher than the South African rates . . .

The expectations (of life) of Canada, New Zealand and the Netherlands are higher (than South Africa) at all ages.'

This is certainly a matter of grave concern for us in this country and suggests the need

1. Pell, S. en D'Alonzo, C. A. (1961): *A Three-Year Study of Myocardial Infarction in a Large Employed Population*, J. Amer. Med. Assoc., **145**, 463.
2. Gonin, H. T. (1960): *Mortality Trends in South Africa: Some Comparisons with Population and Assured Lives' Mortality in Great Britain and Population Mortality in Certain Dominions*. Universiteit van Suid-Afrika.

2. Gonin, H. T. (1960): *Mortality Trends in South Africa: Some Comparisons with Population and Assured Lives' Mortality in Great Britain and Population Mortality in Certain Dominions*. University of South Africa.

Op alle ouderdomme is die lewensverwagting hoër in Kanada, Nieu-Seeland en Nederland as in Suid-Afrika.

Dit is beslis 'n saak van die allergrootste belang vir ons hier in Suid-Afrika, en dit dui aan hoe noodsaaklik dit is om aktiewe ondersoek na die waarskynlike oorsake van so 'n opvallende verskynsel in te stel.

Die publikasie van dr. Adelstein se referaat bewys dat die bestuur van die Suid-Afrikaanse Spoorweë gedurig bewus bly van sy plig om aktiewe ondersoek in te stel na die faktore wat die gesondheid en welsyn van 'n baie groot seksie van die gemeenskap beïnvloed. Die maatskaplike verantwoordelikeheidsgevoel wat deur hierdie aspek van die Departement van Gesondheid en Nywerheidswelsyn aan die lig gebring word, dui daarop dat alle moontlike pogings gedurig in die werk gestel sal word om optimale werk- en lewenstoestande te ondersoek, en tot stand te bring.

Hierdie soort navorsingswerk sal waarskynlik heelwat lig werp op wat bes moontlik belangrike etiologiese faktore in siekte kan wees, of op ander gemeenskapsprobleme soos verkeersongelukke, en miskien sal dit pertinente teenmaatreëls aan die hand doen wat tot voordeel van die land as 'n geheel kan strek.

for active research into the probable causes of such a striking phenomenon.

The publication of Dr. Adelstein's paper indicates an awareness by the management of the South African Railways of its duty to maintain an active and inquiring attitude into the factors influencing the health and welfare of its very considerable community. The sense of social responsibility revealed by this aspect of the work of the Department of Health and Industrial Welfare indicates that every effort will constantly be made to inquire into and establish optimal working and living conditions.

This type of investigation may also well throw much light on what may turn out to be important etiological factors in disease or such other community problems as traffic accidents and may at the same time suggest pertinent remedial means, which could be of benefit to the country as a whole.

## ABSTRACTS

### NARCOTIC ADDICTION IN THE NEWBORN

Infants delivered of narcotic-addicted mothers may present typical withdrawal symptoms. The authors report a premature infant, born of a mother who was an addict to heroin, who developed this syndrome.

[Roman, L. P. *et al.* (August 1958): *Narcotic Addiction in a Newborn Infant*, J. Pediat., **53**, 231-32.]

### AGE, TEMPERATURE AND PERIPHERAL CIRCULATION

While resting in the heat, the older men (41-57 years) had forearm blood flow which was 50% greater than that of the young men (17-26 years). When work was performed in the heat, a further increase in blood flow occurred in both age groups, but the increase was greater in the older men. The increase in blood flow following work did not occur if the work was done at a temperature of 26° C.

[Hellon, R. F. *et al.* (30 April 1958): (Univ. Oxford, Oxford, England). *The Influence of Age on Peripheral Vasodilatation in a Hot Environment*, J. Physiol., **141**, 262-72].

### PITOCIN SNUFF AND LACTATION

Intranasal Pitocin was a practical and effective method of overcoming inhibition of the milk let-down reflex.

[Newton, M. *et al.* (July 1958): *The Effect of Intranasal Administration of Oxytocin on the Let-Down of Milk in Lactating Women*, Amer. J. Obst. Gynec., **76**, 103.]

### MEPROBAMATE IN DETERIORATED EPILEPTICS

Meprobamate (Equanil) was studied in 33 chronic, moderately deteriorated, institutionalized female epileptic patients. Idiopathic and symptomatic epilepsy were represented. All patients suffered both grand mal and petit mal seizures, the latter varying in frequency up to 772 attacks yearly. Petit mal seizures in the group studied were uncontrolled previously, despite continuous drug therapy. In 11 of 33 patients the drug controlled both petit mal and grand mal seizures to a desirable extent. Epilepsy both of idiopathic and symptomatic origin was better controlled than before. Untoward effects were remarkably few in comparison with those induced by other anticonvulsive agents. In selected patients meprobamate is more effective than trimethadione or phenuximide for the control of petit mal seizures.

[Ivanov, A. A. (1 August 1958): *Meprobamate in the Treatment of Chronic Deteriorated, Institutionalized Epileptics*, New York J. Med., **58**, 2529.]

### HUMAN HORMONES AND SPIDERS' WEBS

Spiders fed 2-5  $\gamma$ /spider of histamine, serotonin and noradrenaline produced webs that differed significantly though nonspecifically from the control webs. Comparison of reactions on the first and second day permits distinction between histamine and noradrenaline on the one hand, and serotonin on the other. Furthermore, histamine deviates somewhat from the 'usual' pattern of relations between the various criteria of evaluation.

[Rieder, H. P. (1 June 1958): *The Action of Histamine, Serotonin and Noradrenaline on the Construction of the Web by Spiders*, Arch. Internat. Pharmacodyn., **115**, 326.]

## THE EARLY DIAGNOSIS OF BILHARZIA

## THE KATAYAMA SYNDROME

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The morbidity of fully developed bilharziasis is a problem of tremendous magnitude in Southern Africa. Indeed, with advances in the chemotherapy of and preventive measures against malaria, the latter has receded by comparison in areas cleared for civilized existence. The same cannot be said for schistosomiasis, which is surprisingly prevalent close to the metropolis of Johannesburg, as will be demonstrated by 2 of the 3 cases to be presented.

The purpose of this communication is to stress the early diagnosis of the condition during the phase of migration and incubation of the cercarial larvae into the adult worms, i.e. before the sexual phase with oviposition into the venules of the pelvic and vesical plexuses.

It is necessary briefly to sketch the life cycle of the schistosome for a better appreciation of the symptoms during the earliest stages following infestation.<sup>1</sup>

The adult worms are blood flukes living in the portal blood system and collateral venous circulation of the infected human. Pairs of the dioecious adult worms eventually come to reside in the smaller venules of the bowel wall (*S. mansoni* and *S. japonicum*) or of the vesical and pelvic plexuses (*S. haematobium* and *S. bovis*).

Oviposition by the female occurs in the narrowest part of the venule. By frequent repetition of the process the vein becomes distended, ultimately becoming digested by the secretion of the eggs and the pressure of the numerous, closely packed ova.

From the perivascular tissues the eggs migrate to the mucous and submucous membranes of the bowel or bladder wall, whence they are discharged into the lumen of the respective organ and evacuated with the faeces or urine.

At the time that the eggs escape there is either dysentery or haematuria, but these symptoms are relatively late as compared with those that are the subject of this communication.

*Intermediate Host: The Snail.* The eggs hatch into miracidia or larvae which swim in water and undergo the next part of their life

cycle in appropriate snails. The common one in the northern area of Johannesburg is *Physopsis africana*.<sup>2</sup> The parasite assumes the form of a forked-tailed cercaria which is discharged by the snail into water.

This water is highly infectious to man, the cercaria being able to penetrate even the intact human skin.

Paddling, washing clothes or even wading quickly through such water can cause entry of the cercariae, which drop their tails and burrow into hair follicles. From here they enter peripheral capillary beds and are carried into the general circulation.

At the time of entry into the skin, an itch occurs which is not sufficient to cause any systemic disturbance but which, in retrospect, provides the first clue in early diagnosis of infestation.

The cercariae are transported through the veins to the right side of the heart and to the lungs, where they reach the pulmonary veins and so via the left side of the heart to the aorta. From here they are carried to the mesenteric arteries and portal vessels. Elsewhere they appear to be destroyed or filtered away: only those in the portal system survive. Maturation of the cercariae into adolescent worms occurs in the *intrahepatic* portion of the portal blood.

About 20 days after the skin exposure, the worms are strong enough to migrate against the portal blood stream to the mesenteric and vesical vessels. *S. japonicum* migrates to the superior mesenteric vessels draining the small bowel. *S. mansoni* goes to the venules draining the large bowel and *S. haematobium* and *S. bovis* migrate to the inferior mesenteric vessels and via the haemorrhoids or pudendals into the vesical and pelvic veins.

The incubation period varies. It is estimated to be 10–12 weeks from skin entry to the time that the *S. haematobium* females are ready to lay their eggs.

The cases to be described were detected during the incubation period and the symptoms are just a few of those which are possible.<sup>3</sup>

## CASE REPORTS

**Case 1.** T. C. (a White male aged 17), a fit young man playing cricket for his school First XI, was seen on 24 October 1957.

**Complaints:** Fever, headache, pain behind the eyes. There was a history, given on questioning, of bathing in a dam at Tzaneen 3 weeks before. Although the area is recognized to be endemic for bilharzia, he was 'assured that the water was treated.'

Temperature, 102.4°F.

Pulse, 100 per minute.

Right tympanic membrane, reddened.

Blood Pressure, 120/75 mm. Hg.

Tender liver and descending colon.

Urine, cloudy. Microscopy of Urine: No ova, pus or blood.

**Treatment:** Penicillin by intramuscular injection, sulphafurazole tablets (Gantrisin) and Citro Soda. 25 October: He felt better. Temperature, 99°F. Penicillin, intramuscular injection.

26 October: Pulse, 72 per minute. Temperature, 99.8°F. No further signs except for tenderness over the left colon. No diarrhoea or abdominal pain. Generally feeling better.

27 October: Temperature 98.6°F. Left tympanic membrane red. Penicillin administered. Patient loth to stay in bed. Anxious about playing cricket.

1 November: Headache above the eyes. Nose blocked. Pain in the head, worse on bending forward. 'Feels like sinusitis.' Optic fundi, normal. Both tympanic membranes grey. Tender to pressure over frontal sinuses and antra. Face a little swollen. Potass. Iod. gr. 1½ given. Chlorpheniramine Maleate, 4 mg. *t.i.d.* Decongestant nose drops prescribed.

10 November: Five weeks after exposure, generalized urticaria for one day. Appearance not suggestive of penicillin allergy.

17 November: Temperature, 102.5°F. Intense headache and diarrhoea. No splenomegaly. Both eardrums and pharynx red. Axillary and inguinal glands, superficially palpable. Chest clear. Tender over liver and descending colon.

Blood: No malaria parasites. Leucocytes 12,600 per c.mm., of which 24.5% were eosinophils.

18 November: Bilharzial complement fixation test negative.

22 November: White cells 9,700 per c.mm., of which 49% were eosinophils. TMX agglutinations negative. Chest X-ray clear. No sign of eosinophilic infiltration. No cough or cyanosis.

23 November: In spite of feeling slightly better (Temperature 98°F.) a course of lucanthone (Nilodin, B.W., 75 mg. per Kg.) was begun for 5 days, *i.e.* 400 mg. *t.i.d.* This had the usual effect of nausea and slight yellow coloration of the skin and sclerae. The diagnosis was presumptive of bilharzia.

13 December: Leucocytes, 14,000 per c.mm., with 59% eosinophils. Complement fixation test: doubtful positive. Patient feels well. Urine and stools: No ova.

15 December: In Durban on holiday. Fever and diarrhoea. Severe supra-orbital pain. He lost 6 lb. in weight. Since then he has been well.

The patient and his parents were loth to subject him to rectal biopsy or cystoscopy in

view of his recovery. They did consent to his being given a course of Anthiomaline intramuscularly.

The diagnosis in this case was based on:

(a) Clinical history of exposure.

(b) Rising eosinophil count to substantial levels.

(c) Doubtful positive complement fixation test, with

(d) Symptoms and signs of the migratory phase, *e.g.* general malaise, anorexia, lethargy, headache, sinusitis, swollen face, secondary otitis, urticaria and lymphadenopathy—all suggestive of the allergic reaction to the toxins elaborated.

The response to lucanthone was excellent although it was exhibited just before the diagnosis was finally suggested by the albeit doubtful result of the complement fixation test.

On 18 November 1959 he presented for an insurance check, when a specimen of urine was requested. There were no ova, yet one feels that a sporadic specimen is not sufficient. At this stage he had gained 12 lb. above his best previous weight.

**Case 2.** M. K., a White male aged 13, by coincidence also a keen cricketer.

6 January 1961: At 10 a.m. he complained of abdominal pain. Temperature, 101°F. Abdomen held tense but, as he had been seen a few months before firstly for mumps and then for a streptococcal throat, it was recalled that he was unduly sensitive to even gentle abdominal palpation.

The provisional diagnosis, in the absence of any other signs and prevalence of Coxsackie pleurodynia in the area, was a possible virus infection of that nature.

That same evening he was seen by a colleague who continued his care in the author's absence for the following 3 weeks.

**Complaint:** Fever (104°F.), abdominal pain and vomiting. All systems were negative except for tenderness over the left abdomen. The mother reported an evening rise in temperature for the past 5 days, and a furred tongue. A note was made to watch for typhoid.

8 January: Pyrexial (104°F.) with sweats. The only positive finding was an intensely red nasal mucosa with beads of mucopurulent discharge. Penicillin was given by injection, but the symptoms did not abate.

11 January: An urticarial rash developed. It was construed as a penicillin allergy. It lasted for one day, as in Case 1.

14 January: Blood Count: Normal. Eosinophils: 3.5% of 7,500. Neutrophils: 50.5%. Monocytes: 9.5%. Lymphocytes: 36.5%. Basophils: 0%. Still pyrexial. Cough more obvious.

X-ray of the chest was negative except for a healed Ghon focus. Sinuses and antra showed slight clouding. Ledermycin 150 mg. 6-hourly was prescribed. He improved and went away for the weekend.

30 January: The cough persisted, especially at night. The nasal passages were blocked; post-nasal drip.



2 February: At this stage the author took over the case again. He was in the midst of a course of histamine by iontophoresis on the assumption of a nasal allergy (undetermined) and compound coryza vaccine subcutaneously for the infective element.

On this occasion he showed a diffuse periorbital cedema, blocked nose, post-nasal discharge and generally looked sick, having lost 8 lb. in weight. He was afebrile. Abdominal examination was again difficult and nothing abnormal was elicited. Chest: Right basal rhonchi.

27 February: After he had been seen weekly with no more than a temporary improvement following each histamine iontophoresis, the possibility of an infestation was raised and he was empirically given piperazine for roundworm, with no demonstrable result.

This led to consideration on 6 March of a possible Katayama syndrome.

The surprising revelation was then made of a bathe in a stream just below the Velskoeu Drive-In Cinema in Fontainebleau, on the northern boundary of Johannesburg, on 5 December 1960. This (in retrospect) was followed by intense itching which was also experienced by his younger brother A. K. (Case 3). About 26 days later his evening fever began. His urticaria was 37 days after exposure and lasted one day only.

In retrospect, the possibility of all his symptoms fitting into the Katayama syndrome was very attractive.

On 6 March 1961 he was still coughing and vomiting 'yards' of white mucus at night.

White cell count: 7,100 per c.mm. Neutrophils: 29.5%. Monocytes: 5%. Lymphocytes: 53%. Eosinophils: 12%. Basophils: 0.5%. Haemoglobin: 14.3 g. %. PCV: 42%. MCHC: 34%.

Bilharzia Complement Fixation Test: Doubtful with *S. mansoni* cercarial antigen. Weakly positive with *S. mansoni* worm antigen. TMX agglutinations negative.

Treatment was not started until 17 March, owing to delay in receipt of the complement fixation results.

The eosinophilia was not gross, but the rise was considered to be significant. The effect of histamine by iontophoresis on this count is rather interesting.

17 March: He was still coughing. Spleen just palpable. Periorbital swelling very marked with an almost mongoloid appearance.

Chest X-ray clear: no pulmonary infiltration in spite of cough and rhonchi on various occasions.

17 March: Leucocytes: 6,900 per c.mm. of which 8% were eosinophils. Complement fixation test: Positive (Worm antigen). Weakly positive (Cercarial antigen). Doubtful positive for ova antigen. Urine and stools had no ova. He was given lucaanthone (Nilodin, B.W., 75 mg. per Kg.), i.e. 200 mg. *t.i.d.* for 5 days.

22 March: He was very nauseous but not yellow and on the third day of treatment showed dramatic clinical improvement. The spleen was still palpable. Eosinophils: 7%. Oedema of face almost gone.

30 March: Quite fit and on holiday for recuperation.

Comment: 1. The suspicion of typhoid raised by the author's colleague early in the

illness was not entirely out of place. Manson Bahr<sup>1</sup> states that the Katayama syndrome in non-immune subjects closely simulates typhoid.

2. Respiratory symptoms were severe but not substantiated by X-ray changes.

3. An intense allergic appearance without a demonstrable antigen was very suspicious.

4. The eosinophil count showed a rise, albeit moderate.

5. The child was very ill throughout the development of the symptom-complex.

Case 3. A. K., aged 11, was seen on 17 March 1961. This lad had also bathed in the same stream on 5 December 1960. He was not very ill during all the intervening weeks although, on closer questioning, his mother said that he was reported to have had 'enteritis' and abdominal pain while in the Game Reserve with his school class on 6 March 1961.

On 13 March, when the family attention was focused on him, too, on account of the history, he was 'dog-tired' and complained of sporadic abdominal pain and headache.

It was a great surprise to find that his complement fixation tests on 18 March were strongly positive to all 3 antigens, including that of the ova.

This was in the absence of any real symptoms of illness except for vague malaise and those elicited by cross-examination.

He, too, had had an itch on 5 December 1960, but no sign of urticaria or any other allergic phenomena.

His mother thought he was not as active as usual, even though he had participated for his pack in the Scout Swimming Gala late in February. Blood Count on 18 March: Eosinophils: 5% of 6,700. Hb: 13.7 g. %. PCV: 39%. MCHC: 35%.

Thus the eosinophil count corresponded with the absence of allergic signs and symptoms.

He too was treated with Nilodin in a dose appropriate to his weight.

## DISCUSSION

Rabinowitz,<sup>3</sup> in an excellent review of the Katayama syndrome, stressed that the early manifestations of infestation by bilharzial parasites are not sufficiently well known. He warned about waiting for the full clinical picture of haematuria, ureteric damage and visceral schistosomiasis, at which stage treatment may be ineffective.

Ritchken and Gelfand<sup>4</sup> stated that in most cases manifest bilharziasis may take months before being recognizable by their usual symptoms and signs. In a small number of

cases, however, the toxæmic or allergic phase may give the clue as early as 4 weeks after original exposure. They describe a case in a Bantu male, aged 7½, who presented with fever and vomiting 26 days after known exposure. At this stage there was radiological evidence of gross pulmonary infiltration. Following this case they observed an eosinophil count of 44% of 36,100 on the 32nd day and 49% of 27,400 on the 35th day. The chest skiagram showed a miliary type of lesion in the lower and mid-zones bilaterally.

The complement fixation test was negative, but 78 days after exposure he developed abdominal pain and diarrhoea with passage of ova of *S. mansoni* in the stool. During the preceding 3 weeks his eosinophils were 37% of 16,900 on the 62nd day, with clinical signs of listlessness, pallor and a tender liver with a palpable spleen.

Ritchken and Gelfand<sup>5</sup> observe that the toxæmic stage may be mild or severe. This is borne out by Cases 2 and 3, who were infected on the same day and whose home was the same. They say that cases have been labelled as food allergy. Case 2 was clinically 'allergy undetermined' and was treated as such for 3 weeks.

The features of the syndrome (as stated by Ritchken and Gelfand) are:

1. *Age*. It occurs usually in a child, and is rare in adults. Rabinowitz's case was aged 22. Only a small proportion of infected children are so affected.

2. *Pyrexia*. Periodic rises with or without generalized disturbance. Rigors and headaches may be the presenting symptoms.

3. *Symptoms*. Malaise, anorexia, vomiting, giddiness. Cough is characteristic, with sinus or lung involvement. In the latter there may even be cyanosis.

4. The *liver* is tender during the migratory phase.

5. *Allergic Manifestations*: Urticaria may occur in crops or as a single episode. Angio-neurotic oedema of the orbits, face, penis and scrotum are all possible.

6. *Splenomegaly* with or without superficial lymphadenopathy.

7. *High Blood Eosinophilia*, 20–60%, until active treatment is instituted.

8. *Transitory Lung Changes*: Loeffler's type of eosinophilic infiltration.

Since this phase of the disease is not fatal, there are no pathological specimens. About 35 days after entry of the cercariae they are in the portal veins as young worms. The bilharzial toxæmia produces an intense allergic

reaction towards this stage. It is variously described as a possible liberation of toxic and antigenic material into the circulation.<sup>6</sup>

The question of pulmonary infiltration has been discussed by Crofton *et al.*<sup>7</sup> It has been regarded as a hypersensitivity reaction to various stimuli. The eosinophilic infiltration in the lungs is held to be the result of the process of maturation, where the eosinophils act as histamine carriers to the lungs, where the histamine is inactivated. Ascariasis can cause the same picture on X-ray as can resolving pneumonia, hydatid disease, Hodgkin's lymphadenoma and sarcoidosis.

Vaughn<sup>8</sup> states that the transitory pulmonary shadows in ascariasis are allergic rather than a reaction to migratory larvae. There is no evidence that the mature schistosome migrates anywhere but to the vesical and intestinal plexuses. At a later stage of the disease<sup>9</sup> embolization of ova can occur in massive invasion with obliterative arteritis and hepatic cirrhosis, but if cercariae were present in the lungs they would be there soon after exposure and not 3–4 weeks later. Thus pulmonary signs or symptoms are held to be of an allergic nature rather than an infestation.

Mainzer<sup>10</sup> has described bilharzial asthma as a transient pulmonary infiltration.

Case 2 was X-rayed twice with no evidence of infiltration despite clinical rhonchi in the right lung. As a hospital case he might have had more than 2 chest radiographs, but in his case the cough was nocturnal and due to post-nasal drip from intense allergic sinusitis.

Manson Bahr<sup>4</sup> has noted that in this allergic phase the eosinophil count has been depressed by the use of corticosteroids. Perhaps the empirical use of histamine iontophoresis was responsible for a similar relatively low eosinophil count of 12% in Case 2. Rabinowitz's case, aged 22, had an eosinophil count of 3% of 7,000 at 3 weeks after exposure, 3% of 8,000 at 5 weeks after exposure, yet 3 days later was 58.5% of 11,000—showing a sudden rise which could be missed by infrequent blood studies. This sudden rise in the eosinophils probably suggested the diagnosis to the consultant staff, as it did in Cases 1 and 2.

The value of the complement fixation test,<sup>11</sup> if positive, is inestimable but in a personal communication, Lurie<sup>12</sup> has commented on its erratic nature. Antigenicity is crossed, so that a positive test against *S. mansoni* antigens is not evidence of that particular infestation.<sup>2</sup>

The vague ill health of Case 3 would possibly have gone unnoticed for a longer period had not his brother presented with his severe

symptoms. Eventually he would have possibly developed haematuria, but this is not invariable. This lad, however, had strongly positive complement fixation tests against all 3 antigens, and it is fortunate that he was able to be treated at a time when his urine was still free of ova.

The problem of silent or relatively symptomless early cases is thus strikingly exhibited by Case 3.

Any vague pyrexia of undetermined origin and malaise in children of even town dwellers should be investigated with bilharzia in mind.

In spite of the efforts of the Schistosomiasis Unit of the S.A.I.M.R. in erecting warning notices near known infested areas, the impetuosity of ill-informed children and adults in bathing in such streams is very regrettable.

#### SUMMARY

Three cases are presented of the early diagnosis of bilharzial infestation, as encountered in an urban general practice.

Two of the 3 cases had severe symptoms, while the third was discovered because of his brother's illness.

The wide variety of symptoms of the allergic or toxæmic migratory phase of the schistosome is discussed.

All 3 cases responded very well to lucanthone (Nilodin) in the dose of 75 mg. per Kg. over 5 days.

A plea is made for more publicity regarding the dangers of unrestricted bathing in areas hitherto regarded as free from bilharzia, but which have recently acquired infestation.

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## FOLLICULAR LYMPHOBLASTOMA AND/OR HODGKIN'S DISEASE\*

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The patient, a 43-year-old teacher, suffered from what was histologically diagnosed in 1953 as giant follicular lymphoblastoma or Hodgkin's disease.

Since 1953 various groups of glands have been treated by radiotherapy. The intervals between radiation became increasingly shorter and, at the beginning of 1960, the glands were virtually radioresistant. There was diffuse lymphadenopathy as well as hepato-splenomegaly.

He was treated in Johannesburg with nitrogen mustard but by June 1960 the remissions were lasting for less than 3 weeks. Due to

his critical condition and the development of anasarca, he was treated in July with Meticcorten and Mersalyl, with moderate success.

In August he was given 2 courses of TEM, but the glands enlarged and new nodules developed. The patient was then referred to the Department of Radiotherapy at Pretoria.

The clinical picture on admission is shown in Fig. 1. At this stage the patient was no longer capable of caring for himself. There was advanced subcutaneous infiltration as well as oedema of the right arm.

The patient was therefore treated by chemotherapy. A control biopsy on one of the chest nodules was reported on as a medullary lymphoma, which fitted in with Hodgkin's disease.

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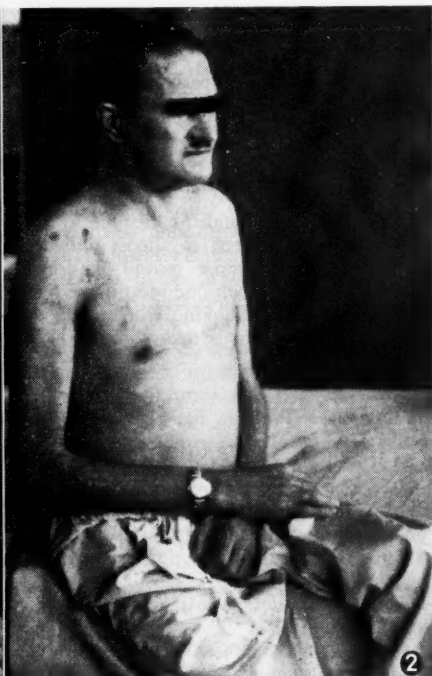
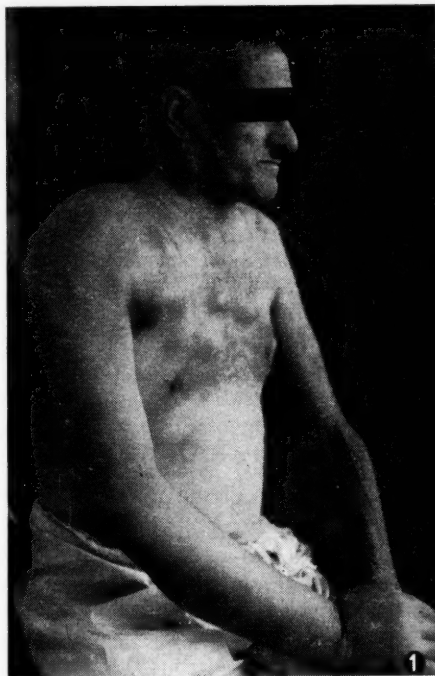
The neoplasm was, if not entirely radio-resistant, too diffuse for radiation. It no longer responded to radiomimetic alkylating preparations such as nitrogen mustard or TEM. Endoxan, also an alkylating preparation, could be of value in such cases; but it is generally more difficult, even though sometimes dramatic, to get good results in the radioresistant group of lymphoma.

Daily injections into veins which were not easily accessible added another technical difficulty. The currently available antimetabolites

the patient had improved with decreased deformity and increased mobility. Fig. 2 illustrates the smaller infiltrates and the decreased oedema.

His present clinical condition shows considerably smaller infiltrates, he can use his right arm, he is stronger and mobile. To maintain and further his improvement Endoxan or VLB could be administered weekly.

Another patient with a lymphoblastic sarcoma was treated with Endoxan. Her advanced



are of almost no value in the therapy of Hodgkin's disease.

The problem then arose of the choice of drug. Because of the patient's advanced condition, it was decided to try VLB.<sup>†</sup> On 30 and 31 August, 18 mg. were given; within 10 days

anaemia, splenomegaly and lymphadenopathy cleared up within 1 month. After 15 months' maintenance on Endoxan her weight increased by 30 lb. and the blood picture returned to normal. At present she is not only asymptomatic but also objectively healthy.

<sup>†</sup> Editor's Note: VLB is Vincalukoblastine sulphate (Co 29060-LE), an alkaloid of *Vinca rosea* Linn, the periwinkle or cat's eye, the anti-cancer activity of which was discovered independently by Dr. R. L. Noble of Collip Research Laboratories of the University of Western Ontario, and the Lilly Research Laboratories in Indianapolis, Ind., U.S.A. Extracts of this ornamental shrub have been used in Europe for a long time to suppress lactation and promote healing.

VLB has been in use at the Indiana University Medical Center, Indianapolis, since March 1959. It

is not a broad-spectrum anti-tumour remedy, but the breadth of the experimental spectrum is not necessarily an indication of its clinical usefulness.

Elsewhere 130 patients have been treated with this drug, which has proved successful in neoplasms of the breast, bronchus, cervix, colon, liver, ovary; in chorionepithelioma, leukaemia, lymphosarcoma, melanoma, rhabdomyosarcoma, thymoma, retinoblastoma and neuroblastoma.

VLB is marketed in South Africa by Eli Lilly and Co. under the proprietary name of Velbe.

A few patients who presented with diffuse lymphadenopathy, splenomegaly and anaemia have been asymptomatic for one year after chemotherapy. Some patients received radiation before treatment with Endoxan. One or two responded very well. One patient with jaundice and hepato-splenomegaly as well as anaemia is well after 6 months' treatment and is now able to work. The diagnosis (Hodgkin's or lymphosarcoma) does not necessarily indicate the prognosis, which depends on the rapid increase of symptoms. This sometimes makes evaluation very difficult.

#### DISCUSSION

*Dr. P. J. Kloppers:* This patient was at school with me and it was the impression, also of his family, that he had been admitted to hospital to die. As will be seen from the photograph taken on admission, he was a very sick man. His improvement was dramatic, and to us who are used to a fatalistic attitude to neoplasms, his improvement is almost unbelievable. It has also become second nature to doubt the diagnosis when one sees in the ward a patient laughing and joking who should not be there. The diagnosis is then confirmed that

he has an inoperable neoplasm. No wonder that the intern says she would rather have patients with such a condition because she can do so much more for them, than someone with emphysema or hemiplegia. It is exciting to see the reactions of these sick people. I wish to state that I am most impressed.

*Prof. H. W. Snyman:* I am gratified to hear you say so. I have attended some cases where I have felt it is one of those things which must be seen to be believed. We could say that the disease would take its own course but if we go back 6 months and ask what the course of a Hodgkin's would then have been, we would all have agreed that the patient would soon die; and that of lymphosarcoma?—the patient would die. To be more scientifically critical we could say that the illness could have healed. I feel, though, that we stand on the threshold of a new era. I would not be surprised if chemotherapy replaces other forms of treatment, radiotherapy as well as the greater part of surgery.<sup>1</sup>

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## DEATH AND SERIOUS DISEASE IN WHITE RAILWAYMEN OF THE SOUTH AFRICAN RAILWAYS

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This paper analyses incidence and causes of death and serious chronic disease among white railwaymen of the South African Railways.

#### THE RECORDS USED

The data analysed are from records of the South African Railway Superannuation Fund, membership of which is compulsory for all but casual servants and is preceded by medical questioning and an examination. (A secondary source of information has been from sick absence and other administrative records).

\* The Department of Health and Industrial Welfare is under direction of J. F. C. du Toit, M.B., B.Ch. (Edin.), D.P.H. (Rand), assisted by E. L. Möller, M.B., Ch.B., D.P.H. (Rand) and A. M. Adelstein, M.D., D.P.H. (Rand) (Research).

The period under review is the 5 years from 1 April 1954 to 31 March 1959, the actuarial quinquennium. There is a large turnover of membership. The exact length of time each individual has belonged to the fund during the review period has not been calculated. The population at risk is estimated by taking the average of those present in each 5-year age group on the first and last days of the 5-year period under review. The average number of men during the period was 95,210.

Two types of events to the members of the fund are recorded and analysed, viz. deaths and permanent ill-health retirements. If an individual is retired because of permanent ill-health and subsequently dies during the 5-year period under review, then this event is counted as a death and not as a retirement.

The permanent ill-health retirements are known as 'boards.'

The population at risk in the Superannuation Fund undergoes continual selection by medical examinations of newcomers and by ill-health retirements. The operative clause for membership is:

'No servant may be admitted to membership if he suffers from a defect which may render necessary his retirement from the service before the prescribed age.'

If a servant, retired because of ill health, has more than 10 years' service, he becomes a pensioner and his subsequent death would be known. If he has less than 10 years' service he receives a gratuity and leaves the organization completely and no further knowledge of his life is recorded. The analysis presented is confined to the members of the Superannuation Fund and excludes the pensioner members from the population at risk. However, the deaths of those pensioners who were boarded and died within the 5-year period under review are included. This has led to a selective factor in the death rate, in that sick persons who become pensioners have a higher death rate than those remaining in the original Superannuation Fund, and consequently the death rates of the Superannuation Fund members are lower than those of the South African male population as a whole.

The records of the Superannuation Fund are kept in a number of categories, the main division being between 'officers' and 'employees' who are, broadly speaking, respectively the white collar or clerical and administrative workers and the manual workers. However, a small amount of interchange takes place, particularly when an employee is promoted to foreman, station master or other relevant supervisory position. Also, there is an occasional transfer by request from one group to another and occasionally there is a transfer from employee to officer group because of ill health or disability. However, the overwhelming majority of men stay in their original category for the entire service period.

A copy of the (abridged) death certificate is available for every death of members of the Superannuation Fund. The death certificate used in South Africa provides for *Cause of Death* and *Contributing Causes or Illnesses*. The answers to these 2 questions are copied on to the abridged death certificate, but other information such as special investigation, duration of illness and additional information, etc. are not on the abridged certificate.

The causes of death were classified by a medical practitioner according to the International Classification of World Health

Organization (6th Revision).<sup>1</sup> It is not proposed to discuss the accuracy of the diagnoses. The men concerned are all members of a sick fund from which they have free medical attention, including extensive specialist services, and it is postulated that the certificates are as reliable as they would be in any community with similar socio-economic development.

## THE FINDINGS\*

### DEATHS

(a) *Incidence.* Table I shows the average number of men, the deaths and the expected number of deaths based on the death rate of males in South Africa (average of the rates for years 1954-59). There are fewer deaths than expected in each of the age groups except the youngest, 15-19 years. The total number of deaths is 321 less than the expected number of 2,663. This smaller number of deaths than expected is probably due to the selection of the relatively unhealthy men by boarding, and by the pre-enlistment medical examinations. The excess in the 15-19 year group can be attributed to certain accidents to be discussed later.

Since June 1955, certain servants have been allowed to elect to stay in the service after the age of 60 until age 63, provided their health is considered good. The average number of such men was 661, and their deaths (42) were less than half the number expected.

Excluding this group of men over 60 years, a comparison of observed deaths with those expected shows that the largest deficit is in the officer group, where the ratio of observed and expected deaths is 73.2%; among the employees (other than engine drivers and firemen) it is 1659:1775 (93.4%); and among the engine drivers and firemen it is 180:156 (114.7%). The officers have the most favourable experience, but this benefit is due in large measure to the number of accidental deaths among the other groups, as will be discussed later.

(b) *Causes.* The main causes of death are shown in Table II. There were 2,342 deaths; 708 or 30% were classified in the Rubric A.81—*Arteriosclerotic and Degenerative Heart Disease*. The next most frequent cause is *Accidental Poisonings and Violence*, which accounts for no less than 601 (25%) of the deaths and this is followed by *Malignant Neoplasms*—293 cases (12.5% of the total deaths).

These 3 main causes thus account for the high total of 68% of all deaths.

\* The tabular data are printed in the *Appendix* at the end of this paper.

### RETIREMENT DUE TO PERMANENT ILL HEALTH

Retirement takes place when a medical board of 2 doctors decides that the member is not fit to carry out his duties. The policy is to allow a long period for possible recovery from any illness and often the board is not carried out before 2 years have elapsed. When a medical board is carried out, a number of factors comes into play to determine the degree of disability, e.g. the work done by the man and his motivation are both important factors. Thus any comparison between the boards in, say, the employees and the officers must take account of such differences.

Table III shows the number of boards among the officers and employees in age groups. The rate of boards is higher among the employees in each age group. This is to be expected, because an officer may be able to do his sedentary work with a condition that would disable an employee who has to perform a physically exacting task.

The total number of boards, excluding the boards who also died during the 5-year period under review, is 1,124 and is considerably less than the number of deaths. The main categories of diagnosis are shown in Table IV.

Heart disease is the most important cause, with arteriosclerotic and degenerative heart disease in the forefront, as it was among the deaths. The next category is a group of disorders of the nervous system, which include psychoneuroses, psychoses, epilepsy and other diseases of the nervous system. These are followed in order by arthritis, bronchitis and pulmonary tuberculosis. In an analysis of disability retirements of American railroads Gerstle<sup>3</sup> has shown an order of incidence of diagnoses which is similar to the order shown here.

### FURTHER DISCUSSION OF SOME LEADING CAUSES OF DEATH AND SERIOUS DISABLEMENT

#### A. ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE

The death rates due to arteriosclerotic and degenerative heart disease among railwaymen discussed thus far are in keeping with the well-known fact that arteriosclerotic and degenerative heart disease is the most frequent cause of death in middle-aged men in developed communities.

The Rubric A.81 includes 3 diagnostic groups:

No. 420: Arteriosclerotic heart disease, including coronary disease;

No. 421: Chronic endocarditis not specified as rheumatic;

No. 422: Other myocardial degenerations.

In the railwaymen, 90% of the cases of group A.81 are classified as no. 420 and in fact 88% are in category No. 420.1, i.e. heart disease specified as involving coronary arteries. Thus in this group of railwaymen A.81 may be considered as if it were coronary artery disease. A similar position pertains in the death certificates of the Census Department when the same age and sex group are involved.

Among the postulates about the causes of arteriosclerotic and degenerative heart disease are the part played by socio-economic status and occupation, and the deaths of the railwaymen are further examined with these factors in view. After a discussion of the selective factors which may influence the data, a comparison will be made between the death rates of the officers and employees, since the officers are employed as clerks and administrators while the employees do a variety of manual occupations.

The records of the population at risk are not available in groupings which will allow more detailed comparisons of occupations if age is also considered. However, the records of deaths can be divided into certain occupational categories. The proportional death rates within each category and age group will be discussed.

(a) *Selective Factors as a Result of Retirements due to Permanent Ill Health.* If a servant is retired due to permanent ill health within 10 years of beginning his service, he is lost to any further records; if retired after 10 years' service he becomes a pensioner. If a servant became a pensioner and died within the 5-year period under review, the death was included in the death records.

Up to age 60 there were 36 officers boarded due to arteriosclerotic heart disease; 9 of these died as pensioners during the period under review. There were 188 employees boarded of whom 37 died. The rate of boards is higher among employees in every age group. Since the employees are engaged in physical work it is not unexpected that there are more cases among them of men who after an attack of heart disease cannot continue their occupation. As mentioned previously, the excess of boards among employees was noted when considering all causes. The clerical group would thus have a relatively higher number of men remaining in service who have suffered attacks of arteriosclerotic heart disease, and the death rate of the clerical group should accordingly be increased. Thus there is a selective factor in the death rates. It would be a small factor as it



is confined to men boarded with less than 10 years' service, seeing that death as a pensioner would be recorded and counted.

Another selective factor which could play a part in influencing these death rates is that when a man becomes ill he may change his occupation. Such changes occur infrequently and are invariably from manual to clerical occupation and not in the other direction.

The point to be emphasized is that every one of the selective factors discussed which influences the records tends to enhance the death rate of the clerically occupied group.

(b) *Deaths due to Arteriosclerotic and Degenerative Heart Disease among Officers and Employees.* The death rates of South African white men from arteriosclerotic and degenerative heart disease averaged for the years 1954-58 have been applied in each age group to the two Railway population groups, 'officers' and 'employees.' The figures are shown together with the actual number of deaths in Table V. In each occupational group the expected number of deaths is close to the actual number observed, viz. among clerical and administrative staff, there were 186 deaths expected and 174 (93%) observed; among the physically employed workers 552 deaths expected and 520 observed (94%). The total numbers for all male personnel are 739 expected and 694 observed (94%).

The small deficiency in observed cases may be due to the selective factors which influence these records, as discussed above. In neither group is the difference between the observed and the expected number statistically significant.

'Old' *Members of the Superannuation Fund:* There is a considerable turnover of staff among both officer and employee groups. If the members who were present at the beginning of the period are considered and all newcomers after this date ignored, the number of men in each age group on 31 March of each of the 5 years is known and a more accurate 'exposure to risk' can be estimated. These figures are shown in Table VI. The number of deaths due to arteriosclerotic and degenerative heart disease observed and the number expected based on the South African male death rates are shown, as well as the actual rates for each group.

The officer group (white collar) has 170 deaths against an expected number of 185, whereas the employee group has 491 with expected number of 501. The officers have 91% and the employees 97% of the expected number. Thus the officers have a more favourable experience, although the difference is not statistically significant.

The rate is higher among officers at each of the three 5-year age groups from 30-44 and higher among employees at each of the 5-year age groups from 45-60 years. At age 60-65 the officers are higher, but this is a selected group and with small numbers.

(c) *Proportion of Mortality due to Arteriosclerotic and Degenerative Heart Disease.* The number of deaths due to arteriosclerotic and degenerative heart disease is shown as a proportion of all deaths in various occupational categories and in age groups in Tables VII and VIII.

Since it will be shown that accident death rates vary according to occupation, such accident deaths are omitted from the total. The subdivision of the death records is made according to occupation and socio-economic status into groupings which are traditionally used by the railway organization, viz. clerks, artisans, semi-skilled workers, labourers, train operating staff, etc.

Comparisons in age groupings are shown in Table VII. In brackets are the percentages which these deaths constitute of all deaths (except death by accident). Statistical tests ( $\chi^2$ ) indicate that the various proportions in the groups could readily have arisen by chance. No clear trend of differences between the occupational groups emerges, other than that, in each age group the artisans have the lowest percentage of deaths due to arteriosclerotic and degenerative heart disease.

A similar procedure is used for comparing proportional death rates in relation to strenuousness of occupation. Within the groups of artisans and semi-skilled workers there is a number of specific occupations, e.g. blacksmith, carpenter, etc. Each occupation was given a rating for physical exertion on a 5-point scale by 4 experienced industrial health inspectors, and the average rating was used. The occupations are compared within socio-economic and age groups (Table VIII). When the expected numbers are small the adjacent columns have been joined.

No significant trends in respect of exertion at work and proportion of deaths due to arteriosclerotic and degenerative heart disease are present. Thus, as in the comparison between white collar workers and others, there is no evidence that exertion at work plays a part in protecting against arteriosclerotic and degenerative heart disease in this analysis of proportional death rates.

(d) *Discussion of Socio-Economic Status and Occupation in Relation to Arteriosclerotic and Degenerative Heart Disease.* No significant differences are present in the death rates or in proportional mortality rates due to



arteriosclerotic and degenerative heart disease when certain occupational groupings are compared, viz.:

- i. Clerical and manual;
- ii. Broad occupational status groups;
- iii. Categories based on strenuousness of occupation.

As mentioned in a report by the Metropolitan Life Insurance Co.,<sup>3</sup> diverse and conflicting results have been reported in statistical studies on the relationship between socio-economic status on the one hand and arteriosclerotic heart disease on the other. In Great Britain arteriosclerotic heart disease appears among the causes of death displaying a more or less definite gradient downwards from social class I to V in the Registrar-General's Decennial Supplement of 1951.<sup>4</sup> Reports by Morris *et al.*<sup>5,6</sup> indicate that exercise at work has a protecting influence against coronary heart disease.

Possibly these factors, occupation, exercise and socio-economic status, exert an effect on the genesis of heart disease, but this effect varies according to the presence of other causative factors. The railwaymen have death rates from arteriosclerotic and degenerative heart disease in keeping with the rates for all South African men and these rates are among the highest for any country in the world (according to published statistics) and considerably higher than the rates of the English male population. At this high level of the disorder it is possible that exercise or socio-economic status does not play as significant a role as has been shown to occur in the British studies. The factor responsible for the high level of atherosclerosis in South Africa would, on this hypothesis, be swamping any effect of exercise or socio-economic status.

(e) *Arteriosclerotic and Degenerative Heart Disease Among Drivers and Firemen.* Drivers and firemen are a group in which a more detailed record of heart disease is available than in other groups. The population at risk is known because the records are kept in a separate schedule by the pension fund administrators, and patients and the doctors are more aware of the implication of the diagnosis in an engine driver.

In January 1958, the Management instructed that all records of drivers be examined and diagnoses of coronary thrombosis reported. This instruction led to a number of cases being brought to notice, so it must be assumed (and indeed it is known) that previous to the instruction such cases, when they recovered, went back to work without notification. These reported cases were almost invariably accom-

panied by specialist and ECG reports. Another group of cases was brought to notice by medical boards and by death certificates. Cases brought to medical board were, before January 1958, those which the examining doctors considered to merit such treatment and will include cases of arteriosclerotic heart disease other than coronary thrombosis if they were thought serious enough to merit a board.

After January 1958, certain cases will be included among the boards, although the patient may have recovered completely, because a diagnosis of coronary thrombosis automatically necessitated a change of occupation or board, whichever was more acceptable to the patient.

Cases first brought to attention by diagnosis of a death certificate were followed up by obtaining the standard sick record kept in the personal files. These records simply state the diagnoses which caused absence from duty throughout the men's careers. Although such diagnoses are not accurate for many conditions, especially short-term absences, it is probable that in serious disease they are reasonably reliable. If there were no diagnoses which suggested a record of arteriosclerotic heart disease, it was assumed that the patient died suddenly before a sick certificate could be issued. Cases of medical board have a fairly comprehensive medical history and clinical record made by 2 doctors.

All these records were used to derive the figures presented. Prevalence rates of heart disease depend largely on the policy of the organization, e.g. when the policy is such that men with arteriosclerotic heart disease must be removed from their work, the prevalence at any time will be minimal. Even in the absence of such a deliberate policy, the seriousness of the condition may necessitate a board, and so the prevalence rates are continually being artificially reduced in any industrial population. Incidence rates in turn depend partly on prevalence unless new cases only are considered. In the analysis which follows only new cases will be considered.

The incidence of new cases includes only those cases which have never had any mention in their records of arteriosclerotic heart disease before 1 April 1954. This analysis is certainly an understatement as far as all arteriosclerotic heart disease is concerned, because cases not diagnosed as coronary thrombosis but as, say, angina pectoris and who recovered and returned to work, may not be included. Thus most cases of angina pectoris will presumably be excluded. All deaths and cases of permanent disablement will be included as well as

those cases which were diagnosed as coronary thrombosis and were still present after January 1958.

Table IX shows the new cases of arteriosclerotic heart disease during the 5 years, i.e. cases in which there is no record of any attack previous to the period under review. The cases are shown in 3 categories. Firstly, those who apparently died in their first attack; secondly, those who survived the first attack and died in another attack during the 5-year period; thirdly, those who survived and were living at the end of the period. (Some of this third group were boarded and some changed their work).

There were 70 new cases, 24 of which died in the first attack, 8 died in a later attack and 38 survived the period under review.

The rate of new attacks is shown in the last column and, as expected, it increases with age. As has been stated before, these rates are certainly an underestimation of arteriosclerotic and degenerative heart disease. A comparative study is available in the Framingham Study<sup>7</sup> in the United States of America. The incidence of new disease reported in that study is higher in every age group than in drivers and firemen, particularly at the lower ages. This is not unexpected, because the Framingham Study was an intensive case-finding survey which included routine electrocardiograms. At the ages 45-50 and 50-55 years, where most drivers' attacks occur, the rates are very close to each other. The rates of attack per 100,000 men per year beginning at age group 30-35 years, in 5-year age groups, are for drivers and firemen and for the Framingham Study respectively 46.7 and 225; 179 and 350; 607 and 649; 1,164 and 1,245.

The main reason for the discrepancy in the younger ages is because there are many firemen at these ages and their attacks have not been reported, whereas the older men are all drivers.

The ratio of sudden deaths to all 'heart' attacks is about 1:5 in the Framingham Study. It is only about 1:3.5 in the drivers and firemen under 45 years and is about 1:4 in the older men.

#### B. DEATHS BY ACCIDENT

In industrially advanced countries accidents have become a leading cause of death. In the United States of America among males age 1-29 years, accidents cause a greater number of deaths than all other causes combined. They are the leading cause of death at ages 30-39 and only heart disease account for a greater number of deaths at ages 40-44.<sup>8</sup>

Among the South African Railwaymen, also, accidents are a leading cause of death. Of the total 2,342 deaths 601 (25%) were caused by the group of causes known as *Accidents, Poisoning and Violence*.

Table X shows the accident deaths according to cause, separately for 'officers' and 'employees,' and according to whether the death was at work or not. Among employees the group *Accidents, Poisoning and Violence* takes first place as a cause of death, viz. 545 deaths. Among these 545 deaths 242 were at work and 303 away from work. Thus accidental deaths, not at work, are the second most frequent cause of death after arteriosclerotic and degenerative heart disease, and accidents at work the third highest cause among the employee group.

It is expected that the employee group should have more deaths at work than the officers since the officers do only clerical and supervisory work; but the employees also have a much higher death rate than the officers from accidents not at work: 82.2 as against 35.1 per 100,000 men per year.

Considering deaths due to motor vehicle accidents not at work, the employees had 158 and the officers 14, giving rates of 43 and 13 per 100,000 men per year, i.e. employees are 4 times more likely to be killed in motor vehicle accidents (not at work) than are officers.

*Circumstances of the Road Accidents.* Official reports of road accidents were available at the Office of Census and Statistics for the period after 1 January 1956. These reports could be traced if the driver was killed or if the passenger died soon after the accident. In a few cases passengers who died a long time after the accident were not named on the accident report. To this extent the analysis is biased.

Table XI shows the road accident deaths according to day of week, the vehicle involved and also whether the deceased was a driver or passenger. Most of the accident deaths were in automobiles (24 drivers and 22 passengers) and the next most frequent were on motor cycles (31 riders and 6 passengers). There were also 12 deaths to pedal cyclists and 10 to pedestrians. The highest number of daily deaths occurred on Fridays and Saturdays, a finding in keeping with published accident reports.

*Time of Day of Road Accidents.* If grouped in hours the accidents are seen to occur predominantly between 5 and 12 p.m.

*Road Deaths According to Occupation and Social Class.* A social class differential has

been noted in the Registrar General's Decennial Supplement of England and Wales (1951 Occupational Mortality).<sup>4</sup> Both *Road Vehicle Accidents* and *Accidents in the Home* increase as the social gradient decreases. Among the railwaymen, also, the difference in rate between officers and employees is possibly the reflection of a difference in socio-economic status. It is not possible to know from our data whether the employees travel more by car than do the officers, i.e. our rate is not based on miles travelled; it is based on the number of men irrespective of exposure to hazards.

**Age.** Table XII shows the motor vehicle accident deaths among employees according to age. The rate is highest in the youngest age group. (This is significant at the 5% level).

**Suicide.** The second most frequent cause of death in the group due to accidents and violence is suicide, of which there were 70 cases; 58 cases were among employees and 12 among officers. The higher rate among employees is most marked in the younger men. The suicide rate has been compared with the rate of all men in United States of America (1953-55)<sup>9</sup> and is about 12% lower.

#### C. DISORDERS OF THE NERVOUS SYSTEM

Disorders of the nervous system are an important group among the boards. It is a group with a variety of categories including organic and functional nerve disorders. The largest subdivision is the group *All Other Diseases of the Nervous and Sense Organs* (A.78). This is a mixed group and includes 20 cases in which vision had deteriorated below the standard required in the occupation, and 4 cases of deafness. There were also 15 cases of hemiplegia which were not further qualified and were probably vascular lesions. There were 7 cases of Parkinson's disease. The rest includes a variety of cerebral lesions.

**Psychoneurotic Disorders** (A.68) are next in frequency with 76 cases. Among them were classified 26 cases of anxiety reaction; 23 psychoneurotic disorders, mixed and unspecified, and 13 cases with neurotic depressive symptoms. The number of cases of psychoneurotic disorders among officers was 28 and among employees 48.

Psychoses account for 58 cases, 16 and 42 respectively among officers and employees.

The rates of board due to psychoses and psychoneuroses are shown in Table XIII. (The rates are based on relatively small numbers and are subject to random fluctuations). The pattern is not regular but in both officer and employee groups there is a tendency to increase with age. The 5 cases of psychoneuroses in

the 20-24 year age group are all among employees. They are semi-skilled or unskilled men; 4 are hypochondriac types and the other an anxiety state. The cases with neurotic depressive symptoms are nearly all 50-60 years old, while those diagnosed as anxiety states are more evenly spread between 30 and 60 years.

Among the psychoneuroses there are only 2 cases of alcoholism. It is reasonably certain that because of social and financial implications the diagnosis of alcoholism is avoided by the doctors.

Another source of information about illness is a register of names of men who apply for extensions of sick leave. The time in a sick absence at which this procedure takes place may vary from case to case and depends on factors such as sick leave already used. Thus the figures do not present a true incidence but rather a minimum incidence. There were 16 cases of psychoses, 42 of psychoneuroses and 28 cases of epilepsy.

#### D. PULMONARY TUBERCULOSIS

There were 54 men boarded with tuberculosis. There were 15 deaths (11 employees and 4 officers). The employees have a decidedly higher rate of board with 48 cases against only 6 among the officers.

Apart from the boarded cases and deaths, there were 137 men who applied for extensions of sick leave because of pulmonary tuberculosis, 11 of the cases being among officers.

The incidence of pulmonary tuberculosis during the 5-year period classified by whether the case was a death, a board or an extension of sick pay is shown in Table XIV. The rate based on all known cases of pulmonary tuberculosis during the 5-year period rises consistently with age from 20 cases at age group 15-25 to 104 cases per 100,000 per year at age group 55-65 years. There were 21 cases among officers and 185 cases among employees, a rate clearly higher among employees.

#### E. BRONCHITIS

This is an important respiratory condition, especially in some countries, e.g. the United Kingdom where it is extremely prevalent. There is considerable dispute about its definition and causes. The factors with most attention are atmospheric pollution, smoking and infection.

The prevalence in South Africa is not thought to be as high as in the United Kingdom. Very few deaths were ascribed to bronchitis, viz. 13. There were 46 boards (4

boarded cases subsequently died and are included in the deaths). Nine cases were among the officers and 37 among the employees, a slight overall excess towards employees.

Among the boards there were a further 24 cases in which bronchitis appeared as a contributory cause, 5 with asthma and 15 with conditions of the heart. Among the deaths there were only 5 cases in which bronchitis was named as a contributory cause. The total incidence of bronchitis as the cause of death, board and as a contributory factor in death and board has been added and expressed as a rate. There are no cases up to age 30. From 30-34, the rate in 5-year age groups per 100,000 men per year is .155, .464, 1.186, 3.235, 6.218, 14.914.

Another measure of morbidity from bronchitis is available from certificates of sick absence. All railwaymen are members of a sick fund and all receive sick pay (conditions of pay vary; in general it is liberal). A small proportion, say about one fifth, of usual pay may be lost by some employees during the first week, but thereafter full pay is received. A sample survey was made of records on the Western Transvaal system. All diagnoses were classified by clerks according to the International Classification. It is appreciated that the diagnoses on these certificates is often not carefully considered and that a good deal of advantage is taken by the men of the liberal attitude of the Administration. However, it is probable that the diagnoses artificially loaded are more likely to be others such as 'flu, fibrositis and gastritis, disorders without readily recognized signs. 'Bronchitis' is probably used when there is at least a cough present.

The population at risk by age groups, the attacks and the days of illness are shown in Table XV. The attack and absence rates per 100,000 men per year are also shown.

The rates in each age group are based on rather small numbers of attacks and are therefore subject to sampling variation. In general both attack and absence rates increase with age.

#### F. MALIGNANT NEOPLASMS

Age specific death rates for each of the cancer categories for the male population of South Africa over a 10-year period (1945-55) were obtained from Dr. A. G. Oetlé, the Cancer Research Officer of South African Institute for Medical Research and applied to our population figures separately for officer and employee groups.

In every category the expected was close to the observed number of deaths and in no case is the difference significant. The overall total is

somewhat smaller than expected, viz. 351 expected and 319 observed deaths. This deficiency is probably due to the selective factors discussed. Dr. Oetlé expressed the opinion that the close association between expected and observed number of deaths lends some support to the accuracy of the national figures because the railwaymen involved are all members of a free sick fund with adequate full consultation services and the diagnoses probably are on a high level of accuracy. The commonest site involved is bronchus and lung (74 cases), followed by stomach (63), then lymphosarcoma (25 cases) and leukaemia (20), intestine (14), skin (9), buccal cavity (8), oesophagus (8), rectum (6), larynx (6), prostate (6), breast (2), bone (2), all others and unspecified (76).

In none of the categories was there any significant difference between the rates of officers and those of employees.

#### SUMMARY

An analysis is made of deaths and retirements due to permanent ill-health of members of the pension fund of the South African Railways during a 5-year period. The men are between the ages of 15-63 years and they are divided primarily into a white collar and a physically occupied group.

The main causes of death are arteriosclerotic and degenerative heart disease (30%), accidents (25%) and malignant neoplasms (12.5%). Among the retirements, arteriosclerotic and degenerative heart disease is also the main cause, followed by disorders of the nervous system, arthritis, bronchitis and pulmonary tuberculosis.

No significant difference in death rates due to arteriosclerotic and degenerative heart disease is observed between the white collar and the physically occupied groups, nor in the proportions of deaths due to arteriosclerotic heart disease when the death cases are grouped according to strenuousness of occupation. The death rates of the railwaymen from this disease are in keeping with the rates of all South African males which are among the highest when countries are compared.

An estimate is made of new cases of arteriosclerotic and degenerative heart disease among drivers and firemen. At the older age groups, 45-55 years, these rates are similar to those reported in a study in the United States of America, and the rate is about 1% per year at age 50-55 years.

Accidents are a leading cause of death, and among the physically occupied group they are the first cause with more deaths than from arteriosclerotic heart disease. The physically

occupied group have more deaths from accidents while not at work than from accidents at work. Their death rate by road accidents (while not at work) is 4 times higher than that of the clerks and administrators.

Psychoneuroses account for 76 cases of boards and psychoses 65 cases (i.e. 7.3% and 6.3% of all) there being in general a tendency for an increase with age.

Pulmonary tuberculosis is still a serious cause of illness with 207 cases known during the 5 years. There is a distinct increase with age from 20 cases per 100,000 per year at age 15-25 years to 104 cases at age 55-65 years. There is also evidence of the operation of a socio-economic factor.

The rates are given for bronchitis. Malignant neoplasms are shown to have death rates in keeping with those of the male white population of South Africa. Bronchus and lung are the commonest sites involved, followed by stomach.

We thank the General Manager of the South African Railways for permission to submit this paper for publication, and also the officers who gave us so much advice and information, particularly Mr. T. N. Talbot, Chief Pensions Officer, Mr. E. C. Fleming, Superintendent Staff, Mr. B. J. van der Walt, Chief Welfare Officer and Mr. I. J. Oelofse for painstaking computing.

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#### APPENDIX

TABLE I: MEAN OF NUMBER OF MEN PRESENT ON 31 MARCH 1954 AND ON 31 MARCH 1959, DEATHS DURING THE PERIOD AND DEATHS EXPECTED BY DEATHRATE OF ALL SOUTH AFRICAN WHITE MEN. (MEAN RATE 1954-1958)

Age (Years)	Mean Number of Men				Deaths Observed	Deaths Expected
	Officers (Clerical)	Employees (Manual)	Drivers and Firemen (Employees)	All Men		
15-19	1,360	5,091	177	6,628	70	47.7
20-24	3,168	8,058	1,611	12,837	121	148.3
25-29	2,604	7,965	1,755	12,324	120	125.1
30-34	2,575	9,033	1,284	12,982	145	163.7
35-39	2,943	8,923	1,053	12,919	211	225.4
40-44	2,451	8,689	669	11,809	229	305.9
45-49	2,312	8,223	593	11,128	420	455.5
50-54	2,206	6,126	584	8,916	525	570.2
55-59	1,693	3,348	55	5,096	459	520.1
60-63	235	426	—	661	42	102.0
Total	21,547	65,882	7,781	95,210	2,342	2,662.9
Deaths:						
Observed	461	1,659	180	2,300		
Expected up to Age 60	629	1,776	157	2,562		



TABLE II: DEATHS IN OFFICER AND EMPLOYEE GROUPS—LEADING CAUSES

Cause	No. of Deaths		
	Officers	Employees	All Men
Arteriosclerotic and degenerative heart disease .. ..	180	528	708
Accidents, Poisonings and Violence. (External cause) .. ..	56	545	601
Malignant Neoplasms .. .. .	77	239	316
Other diseases of heart .. .. .	28	102	130
Vascular lesions affecting central nervous system .. ..	26	94	120
All other causes of death .. .. .	111	356	467
All causes .. .. .	478	1,864	2,342

TABLE III: BOARDS ACCORDING TO AGE AND OCCUPATIONAL GROUP: 5-YEAR PERIOD  
(EXCLUDING BOARDED CASES WHO DIED)

Age Group (Years)	Number of Boards			Rate Per 100,000 Men Per Year		
	Officers	Employees	All Staff	Officers	Employees	All Staff
15-19	1	8	9	14.7	30.3	27.1
20-24	—	25	25	—	51.7	38.9
25-29	2	24	26	15.3	49.3	42.1
30-34	4	36	40	31.0	69.7	62.0
35-39	13	63	76	88.3	126.3	117.6
40-44	15	93	108	122.4	198.7	182.9
45-49	24	150	174	207.6	340.2	312.7
50-54	43	256	299	389.8	763.0	670.7
55-59	93	263	356	1,098.6	1,545.6	1,397.1
60-63	2	9	11	170.2	422.5	332.8
Total	197	927	1,124			

TABLE IV: LEADING CAUSES OF BOARDS  
Boarded cases who died are shown in brackets and are not included in the other figures

	Officers	Employees	All Staff
<i>Cardio-Vascular Diseases</i> .. ..	47(16)	260(47)	307(63)
<i>A Code:</i>			
81 Arteriosclerotic and Degenerative Heart Disease .. .. .	29(7)	171(21)	200(28)
80 Chronic Rheumatic Heart Disease .. .. .	1(2)	11(1)	12(3)
82 Other Diseases of Heart .. .. .	11(2)	46(16)	57(18)
83 Hypertension with Heart Disease .. .. .	1(5)	18(4)	19(9)
84 Hypertension without mention of heart .. .. .	5(—)	14(5)	19(5)
<i>Disease of the Nervous System and Sense Organs</i> .. .. .	62(3)	223(10)	285(13)
78 All other diseases of the Nervous System and Sense Organs .. .. .	15(1)	72(4)	87(5)
68 Psychoneurosis and Disorders of Personality .. .. .	27(1)	47(1)	74(2)
67 Psychosis .. .. .	16(1)	42(3)	58(4)
73 Epilepsy .. .. .	4(—)	50(2)	54(2)
69 Mental Deficiency (9)	—	12(—)	12(—)
71 Meningitis (1)			
72 Multiple Sclerosis (2)			
122 Arthritis and Spondylitis .. .. .	23(—)	83(4)	106(4)
93 Bronchitis: Chronic and Unspecified .. .. .	8(2)	47(3)	55(5)
001 Tuberculosis of the Respiratory System .. .. .	6(—)	48(5)	54(5)
66 Allergic, Other Endocrine and Blood Disease .. .. .	3(—)	20(6)	23(6)
100 Ulcer of Duodenum .. .. .	4(1)	19(—)	23(1)
All Other Causes of Permanent Ill-health .. .. .	44(11)	227(32)	271(43)
	197(33)	927(107)	1,124(140)

TABLE V: DEATHS DUE TO ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE (A.81).  
EXPECTED NUMBERS BASED ON AVERAGE SOUTH AFRICAN MALE DEATH RATE OF YEARS 1954-1958

Age Group (Years)	Death			
	Officers, i.e. Clerical and Administrative		Employees, i.e. Almost Entirely Physical Work	
	Observed	Expected	Observed	Expected
15-19 .. .. .	—	.1	2	.2
20-24 .. .. .	2	.5	1	1.5
25-29 .. .. .	—	1.2	8	4.5
30-34 .. .. .	5	3.0	16	12.2
35-39 .. .. .	16	11.2	28	38.1
40-44 .. .. .	18	19.3	56	73.6
45-49 .. .. .	31	34.1	126	130.0
50-54 .. .. .	40	55.3	170	168.3
55-59 .. .. .	62	62.0	113	124.5
15-59 .. .. .	174	186.6	520	552.7
Standardized Mortality Ratio ..	93%		94%	

TABLE VI: DEATHS DUE TO ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE AMONG 'OLD' MEMBERS OF THE SUPERANNUATION FUND BY AGE AND OCCUPATIONAL GROUP: EXPECTED DEATHS BASED ON SOUTH AFRICAN WHITE MALE DEATH RATE OF YEARS 1954-1958

Officers (Clerical)					Employees (Physical)				
Age Group (Years)	Years of Exposure	No. of Deaths		Death Rate per 100,000 Years Exposed	Years of Exposure	No. of Deaths		Death Rate per 100,000 Years Exposed	
		Observed	Expected			Observed	Expected		
15-19	1,392	—	·0	—	5,243	—	—	—	
20-24	8,821	1	·2	11·3	27,186	—	—	—	
25-29	10,925	—	1·0	—	36,515	7	3·3	19·2	
30-34	10,823	5	2·5	46·2	43,703	15	10·3	34·3	
35-39	14,646	14	11·1	95·6	44,371	24	33·9	54·1	
40-44	12,097	18	19·0	148·8	42,098	54	66·2	128·3	
45-49	11,298	30	33·3	265·5	40,783	118	120·3	289·3	
50-54	11,283	40	56·5	354·5	32,652	162	163·8	496·1	
55-59	8,327	62	60·9	744·6	12,818	111	93·8	866·0	
15-59	89,612	170	184·5	—	285,369	491	501·7	—	

TABLE VII: DEATHS DUE TO ARTERIOSCLEROTIC HEART DISEASE BY OCCUPATIONAL AND AGE GROUP. FIGURES IN THE BRACKETS ARE THE PERCENTAGE OF ALL DEATHS (EXCEPT ACCIDENTS)

Age Group (Years)	Clerical	Artisans	Semi-Skilled	Labourers	Others	All Men	$\chi^2$	P
50-59	108 (42.7%)	28 (32.9%)	43 (38.4%)	51 (49.0%)	168 (44.2%)	398 (42.6%)	6.17	.2 --.1
40-49	49 (46.7%)	23 (41.1%)	32 (47.8%)	29 (47.5%)	101 (45.7%)	234 (45.9%)	1.17	.9 --.8
15-39	23 (35.9%)	5 (11.4%)	6 (35.3%)	5 (15.6%)	40 (28.9%)	79 (26.8%)	11.06	.05--.02

TABLE VIII: DEATHS DUE TO ARTERIOSCLEROTIC HEART DISEASE (A.81) BY PHYSICAL DEMAND OF WORK  
 1: Least Strenuous 5: Most Strenuous  
 %: Deaths due to Arteriosclerotic Heart Disease as % of all Deaths (Except Accidents)

Age Group (Years)		Deaths by Physical Demand of Work																	
		Artisans						Semi-Skilled						Others					
		1	2	3	4	5	1-5	1	2	3	4	5	1-5	1	2	3	4	5	1-5
50-59	A.81 All deaths %	5	12	11	14	30	—	2	9	26	6	43	—	19	81	48	10	168	—
		41.7	38	28.9	36.8	88	—	5	27	60	20	112	—	34	204	94	27	380	—
		—	—	—	—	34.1	—	40.0	33.3	43.3	30.0	38.4	—	55.9	39.7	51.1	37.0	47.6	44.2
		$\chi^2 = 1.63$ P						$\chi^2 = 1.51$ P						$\chi^2 = 6.00$ P					
		-5--4						-7--6						-2--1					
40-49	A.81 All deaths %	14	37	9	23	—	—	5	20	7	32	—	—	12	51	29	9	101	—
		37.8	19	56	47.4	41.1	—	13	43	11	67	—	—	19	103	71	28	221	—
		—	—	—	—	—	—	38.5	46.5	63.6	47.8	—	—	63.2	49.5	40.8	32.1	45.7	—
		$\chi^2 = .47$ P						$\chi^2 = 1.57$ P						$\chi^2 = 5.71$ P					
		-5--4						-5--4						-2--1					
15-39	A.81 All deaths %	2	33	3	5	—	—	4	2	6	—	—	—	23	10	7	40	—	—
		6.1	11	27.3	11.4	—	—	12	5	17	—	—	—	60	41	37	138	—	—
		—	—	—	—	—	—	33.3	40.0	35.3	—	—	—	38.3	24.4	18.9	29.0	—	—
		$\chi^2 = 1.88$ P						$\chi^2 = .07$ P						$\chi^2 = 4.79$ P					
		-2--1						-8--7						-1--05					

TABLE IX: KNOWN FIRST ATTACKS OF ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE AMONG DRIVERS AND FIREMEN (1 APRIL 1954 TO 31 MARCH 1959)

Age Group (Years)	Mean No. of Men	Deaths During 5-Year Period		Survivors During 5-Year Period	All First Attacks	Rate per 100,000 Men per Year
		In First Attack	Later Attack			
25—	1,755	—	—	1	1	11.4
30—	1,284	2	—	1	3	46.7
35—	1,053	3	1	3	7	132.9
40—	669	2	—	4	6	179.3
45—	593	5	2	11	18	607.0
50—	584	11	5	18	34	1,164.3
55—	55	1	—	—	1	363.6
		24	8	38	70	

TABLE X: DEATHS CAUSED BY ACCIDENTS, POISONINGS AND VIOLENCE: (B.E. 47—50) 1 APRIL 1954 TO 31 MARCH 1959

	Officers		Employees		All Men	
	*IOD	Not IOD	IOD	Not IOD	IOD	Not IOD
Motor vehicle accidents .. .. .	2	14	21	160	23	174
Other transport accidents .. .. .	11	—	187	19	198	19
Accidental poisoning .. .. .	—	1	—	3	—	4
Accidental falls .. .. .	—	—	1	5	1	5
Accidents caused by machinery .. .. .	—	—	3	—	3	—
Accidents caused by fire and explosion of combustion material .. .. .	—	—	—	—	—	—
Accidents caused by hot substances, corrosive liquid, steam and radiation .. .. .	—	—	—	1	—	1
Accidents caused by firearm .. .. .	—	—	—	5	—	5
Accidental drowning and submersion .. .. .	—	4	—	25	—	29
All other accidental causes .. .. .	2	6	25	15	27	21
Suicide and self-inflicted injury .. .. .	—	12	—	58	—	70
Homicide and injury purposely inflicted by other persons (not in war) .. .. .	—	3	—	11	—	14
All other and unspecified effects of external causes .. .. .	—	1	2	1	2	2
All accidents .. .. .	15	41	242	303	257	344

\*IOD: Injury on Duty.

TABLE XI: DEATHS CAUSED BY MOTOR VEHICLE TRAFFIC ACCIDENTS, NOT AT WORK. ALL RAILWAYMEN

Day	Automobile		Motor Cycle		Pedal Cycle	Pedestrian	Total
	Driver	Passenger	Driver	Passenger			
Monday .. .. .	2	4	4	1	2	3	16
Tuesday .. .. .	3	3	—	1	—	2	9
Wednesday .. .. .	3	4	4	—	3	—	14
Thursday .. .. .	5	2	2	1	1	—	11
Friday .. .. .	3	4	8	1	1	3	20
Saturday .. .. .	6	2	7	1	2	2	20
Sunday .. .. .	2	3	6	1	3	—	15
Total .. .. .	24	22	31	6	12	10	105

TABLE XII: DEATHS CAUSED BY MOTOR VEHICLE ACCIDENTS, NOT AT WORK, AMONG EMPLOYEES

Age Group (Years)	No. of Men (Mean)	No. of Deaths	Rate per 100,000 Men per Year
15—24	14,937	57	76.3
25—34	20,037	34	33.9
35—44	19,334	29	30.0
45—54	15,526	29	37.3
55+	3,829	11	57.4
All Ages	73,663	160	

TABLE XIII: BOARDED CASES OF PSYCHOSES AND PSYCHONEUROSES BY AGE

Age Group	Cases		Cases per 100,000 Men per Year	
	Psychoses	Psychoneuroses	Psychoses	Psychoneuroses
15— .. .. .	—	—	—	—
20— .. .. .	6	5	9.4	7.8
25— .. .. .	7	2	11.4	3.3
30— .. .. .	3	3	4.7	4.7
35— .. .. .	6	8	9.3	12.4
40— .. .. .	7	4	11.9	6.8
45— .. .. .	8	13	14.4	23.4
50— .. .. .	8	19	18.0	42.6
55— .. .. .	17	22	66.7	86.3
15—60 .. .. .	62	76		

TABLE XIV: PULMONARY TUBERCULOSIS: ALL NOTIFICATIONS BY DEATH CERTIFICATE, BOARD AND EXTENSION OF SICK PAY

Age Group (Years)	No. of Cases				Cases per 100,000 Men per Year
	Boards	Deaths	Sick Pay	Total	
15—24	1	1	18	20	20.5
25—34	9	1	27	37	29.3
35—44	14	2	38	54	43.6
45—54	18	3	27	48	47.9
55+	13	8	9	30	104.2
Age not known	—	—	18	18	—
All Ages	35	15	137	207	43.5

TABLE XV: INCIDENCE OF BRONCHITIS: WESTERN TRANSVAAL SYSTEM: SAMPLE SURVEY OF SICK RECORDS

Age Group (Years)	No. of Months Exposed	No. of Men with Attacks	No. of Attacks	No. of Days Absent	Rate per 1,000 Men per Year	
					Attacks	Days
10-19	19,214	48	59	343	36.8	214.2
20-29	62,315	140	157	1,285	30.2	247.4
30-39	81,733	198	238	2,031	34.9	298.2
40-49	73,408	214	337	3,165	55.1	517.4
50+	22,082	75	98	1,105	53.2	600.4

## NOTES AND NEWS : BERIGTE

Dr. Samuel Hoffman, of Johannesburg, has been elected a Fellow of the Faculty of Anaesthetists of the Royal College of Surgeons in Ireland.

Dr. B. C. Uys, M.B., B.Ch., M.R.C.O.G., has commenced practice as a specialist obstetrician and gynaecologist at 705 Medical Arts Building, 220 Jeppe Street, Johannesburg. (Telephone: 22-9368.)

At the meeting of the Council held in London on 27 May 1961, Miss Lilian Raftery, M.R.C.O.G., M.M.S.A., M.R.C.S., L.R.C.P., was admitted *in absentia* to the Fellowship of the Royal College of Obstetricians and Gynaecologists.

## THE FIRST EUROPEAN CONGRESS ON ANAESTHESIOLOGY

This will be organized by the Austrian Society of Anaesthesiology in Vienna from 3 to 8 September 1962.

The former Imperial Palace will serve as the meeting place for the Scientific Congress as well as for a Post-graduate Medical Training Course.

English, French and German will be the official languages. Provisions will be made for simultaneous translation.

The main subjects of the Scientific Congress are:

1. Recovery Rooms and Special Care Units.
2. Anaesthesia and the Elderly Patient.
3. Anaesthetic Problems in Emergency (Non-Traumatic) Surgery.
4. Miscellaneous Papers (10-15 minutes each) (limited number).

This programme will be supplemented by a series of Symposia on specific problems of anaesthesia and related questions. Participants who wish to organize a Symposium (90-120 minutes) should communicate with the Scientific Secretary (who will also give any other information concerning the scientific pro-

gramme) before 1 November 1961, at the very latest. These participants should indicate, at the same time, the subject of their symposium as well as the names of the discussants. (Address: Dr. Karl Steinbereithner, Medizinische Akademie (Post-graduate Medical School), 4 Alserstrasse, Vienna IX).

For further information kindly write to the Secretary-General, Dr. Rudolf Kucher, Medizinische Akademie, 4 Alserstrasse, Vienna IX, Austria.

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## EXTERNAL CARDIAC MASSAGE

Colour, 21 minutes.

The subject of the film is external cardiac massage, a recently developed technique for restarting hearts, which have stopped beating, without opening the chest.

Produced in co-operation with the developers of the technique, R. Jude, W. B. Kouwenhoven and G. Guy Knickerbocker, all of the Johns Hopkins Medical Institutions, *External Cardiac Massage* shows how the technique substitutes externally applied pressure for the rhythmic contractions of normal heart muscle, thereby maintaining circulation at a level sufficient to sustain life.

The technique, which has been termed 'strikingly effective,' may well revolutionize the concept of reviving hearts that have failed. In more than 100 cases of cardiac arrest treated by this method at the Johns Hopkins Hospital, 62% were successfully resuscitated to their previous cardiac and central nervous system status.

An animated sequence in the film illustrates how manual depression of the lower sternum compresses the heart, forcing blood into the pulmonary and systemic vessels. Release of the pressure allows the chest to expand and the heart to fill again.

If external cardiac massage, combined with assisted ventilation, is begun within four minutes after cardiac arrest, the central nervous system will receive enough oxygen to prevent serious damage.



The film shows the steps to be taken to resuscitate patients when heart arrest or ventricular fibrillation occurs both within and outside the hospital. It also distinguishes between heart arrest and ventricular fibrillation, illustrates the use of the external fibrillator as part of the resuscitation technique and demonstrates the application of the technique to infants

and children. No product references of any kind are made.

Bookings may be arranged through local SK & F representatives or by writing to P.O. Box 38, Isando, Transvaal. Whenever possible, 4 weeks' prior notice should be given and an alternate showing date of at least one month after the preferred date.

#### THE ULTRASTRUCTURE OF CELLS

The Sandoz Organization in Switzerland has issued in English a magnificently produced monograph prepared by Dr. Marcel Bessis, Director of the Research Laboratories of the National Blood Transfusion Centre. Fully one half of the monograph consists of reproductions of cells photographed by electron microscopy, with a concluding chapter on the cancer cell. The ultrastructure of spermatozoa is illustrated (in reduced form in Figs. 1—3).

A limited number of copies of the monograph is available in South Africa. Those interested should write without delay to:

Sandoz Pharmaceutical Department, P.O. Box 4461, Johannesburg.

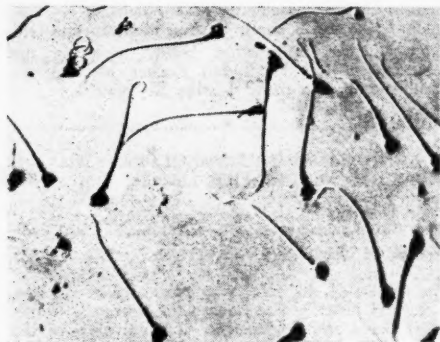


Fig. 1. (Magnification about 600  $\times$ .) Spermatozoa viewed under the optical microscope after shadowing.

Original magnification about 1,000  $\times$ .



Fig. 2. (Magnification about 10,000  $\times$ .) The head and middle-piece of a spermatozoon examined in section with the electron microscope. The cap enclosing the head, nucleus and the centriole as well as the mitochondrial sheath enclosing the axial filaments is seen.

Original magnification about 20,000  $\times$ .

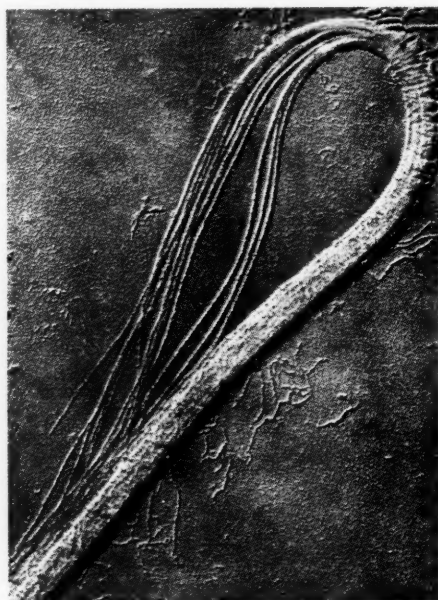


Fig. 3. (Magnification about 12,000  $\times$ .) End-piece of the tail of a spermatozoon showing 9 filaments in the caudal sheath, plus 2 axial filaments.

Original magnification about 35,000  $\times$ .